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(54) **Conversion of decoded interlaced video into progressive scanning system taking account of scanning system before coding**

Umwandlung von ins Zeilensprung-System dekodiertem Video in Vollbild-Video unter Berücksichtigung des Abtastsystems vor Kodierung

Conversion d'un système de balayage entrelacé de vidéo décodé en un système de balayage progressif, tenant compte du système de balayage avant codage.

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EP-A2- 0 710 018
EP-A2- 0 757 482
JP-A- 9 182 032
US-A- 5 365 273
US-A- 5 444 491

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Description

Background of the Invention

1. Field of the Invention

[0001] The present invention relates to a scanning system converting apparatus and a method for the same, and more particularly to the technique in which a scanning system is converted from an interlace scanning system into a progressive scanning system when an image data which is coded by a coding system such as the MPEG2 (Moving Picture Expert Group 2) is decoded.

2. Description of the Related Art

[0002] As image data which can be coded in accordance with MPEG2, there are image data which are coded by an interlace scanning system which is used in monitors such as an NTSC TV monitor and image data which are coded by a progressive scanning system which is used in monitors such as a monitor of a personal computer. When image data coded in accordance with the MPEG2 are received through a communication line, decoded image data must be outputted to the NTSC TV monitor in the interlace scanning system.

[0003] However, it is often requested that the image data is outputted in the interlace scanning system and, at the same time, is outputted to a monitor of the progressive scanning system such as the monitor of the personal computer. In such a case, it is necessary for a scanning system converting apparatus to convert the scanning system of the image data outputted from the interlace scanning system into the progressive scanning system.

[0004] However, conventionally, when the image data of a progressive scanning system originally is coded in accordance with the MPEG2, there is a problem in that the image quality is degraded, when the scanning system of the decoded image data is converted into the progressive scanning system by the scanning system converting apparatus, compared with the image quality before coding.

[0005] In the image signal of the interlace scanning system, the sampling position of the image data is shifted between a previous field and the current field in a vertical direction, as shown in relation of frame period and vertical axis of Fig. 1. Thus, it is necessary to determine whether or not there is a change in the images between the fields, when the scanning system of the image data is converted from the interlace scanning system into the progressive scanning system. For this determination, there is a method of calculating a difference between a signal interpolated from the upper line and the lower line and a signal in the previous field, as shown in Fig. 1. However, in this method, there is a case where the signal which is obtained by the interpolation greatly differs from an actual signal in the region with a high vertical resolution.

[0006] Also, as shown in Fig. 2, there is a method of determining a signal difference between the frames. However, when the image changes at a frequency which is higher than 30 Hz, the change can not be detected. Therefore, the image data whose scanning system is to be converted into the progressive scanning system is not identical with the image data before coding with any of the above methods.

[0007] Also, in a case contrary to the above, that is, when the image data of the interlace scanning system is coded in accordance with the MPEG2, the decoded image data is outputted in accordance with the progressive scanning system, and further the scanning system of the decoded image data is converted from the progressive scanning system into the interlace scanning system, there is a problem in that the image quality is degraded compared with the image quality before coding, as described above.

[0008] In addition, a video signal processing method is described in Japanese Laid Open Patent Application (JP-A-9-182111). In this reference, an interlace component signal of 270 MHz in a (4: 2: 2) signal format is inputted to the video processing circuit from an input terminal 1, and converted into a 10-bit signal of 27 MHz in parallel in the processing circuit. Also, first and second blocks of a progressive component signal are inputted from the input terminals 1 and 2. An interpolating operation is performed to the color components of the first and second signal blocks so as to generate a serial signal of 360 MHz in a (4: 2: 2: 4) signal format. Then, the serial signal is converted into a 10-bit parallel signal of 36 MHz. Finally, these component signals are re-converted into the signal formats in the input.

[0009] Also, a video display system is described in Japanese Laid Open Patent Application (JP-A-8-251504, also published under EP-A-0714203). In this reference, a video signal is received in a switch 106. A user can select, by the switch 106, at least one of auxiliary channel by which a main channel image and a special function image can be viewed, when he does not want to view the main channel image for the special function image. A main video channel data is converted in scanning system from an interlace scanning system into a progressive scanning system by a scanning system converter 216. A logic unit 212 processes an auxiliary channel data to format into a selected special function. The data is inputted into the scanning converter 216 and the special function image is displayed at a proper position to the main channel image.

[0010] Also, a TV signal transmission apparatus is described in Japanese Laid Open Patent Application (JP-A-4-O79685). In this reference, the TV signal transmission apparatus is composed of a first motion detecting section for detecting a motion in a frame of an image data of a progressive scanning system and a second motion detecting section for detecting a motion between frames of an image data of an interlace scanning system. When motion is detected by the first motion detecting section

and motion is not detected by the second motion detection section, a fixed value is added to a transmission signal so that the motion can be detected based on the fixed value.

[0011] In EP-A-0 743 788 an automatic scanning format converter with seamless switching is disclosed. More specifically, an apparatus which converts different scanning formats of different sources and can switch seamless between different formats, e.g. interlace and progressive format is disclosed. Therefore, different conversion paths, namely a P-I conversion path and an I-P conversion path are provided. In the P-I and I-P conversion paths different signal processing delays occur which are compensated by a frame memory (delay) network. This allows seamless switching between, for example, a television commercial in the progressive scan format and a television main program material in interlace scan format.

[0012] US-A-5 444 491 discloses a television receiver for receiving and decoding a transmitted television signal. The television signal comprises image frames encoded in different transmission formats, which may include progressive scanning formats. These formats are selected from a set of transmission formats and differ from each other in non-program-content characteristics, such as spatial-resolution and frame-rate. With the image frames additionally format identification information is transmitted. The television receiver comprises means for receiving this format identification information and means for decoding the encoded image frames using the format identification information. The television receiver additionally may include transmission format means for using the decoded identification information to transform the format, e.g. an interlaced format, of the received image frames from transmission format to the display format, e.g. progressive format.

[0013] JP-A-09 182 032, EP-A-0 757 482, EP-A-0 710 018 an US-A-5 365 273 disclose further alternatives of scanning format conversion.

Summary of the Invention

[0014] The present invention is accomplished to solve the above problems in the conventional examples. Therefore, an object of the present invention is to provide a scanning system converting apparatus and a method for the same, in which the image quality of an image after conversion is not degraded, compared with the image quality of an original image, when a scanning system of an image data is converted from an interlace scanning system into a progressive scanning system.

[0015] In order to achieve an aspect of the present invention, there is provided a scanning system converting system for a display unit of a progressive scanning system according to claim 1.

[0016] In the scanning system converting system, the coded image data is desirably obtained by coding the first image data based on a MPEG2, and a decoder desirably decodes the coded image data based on the MPEG2.

[0017] In order to achieve another aspect of the present invention, there is provided a method of converting a scanning system of an image data signal into a progressive scanning system according to claim 3.

[0018] In this method, original image data may be obtained by coding an image data based on a MPEG2, and a decoding step may include decoding the coded image data based on the MPEG2.

[0019] Other aspects of the invention are set forth in the dependent claims, the drawings and the following description.

Brief Description of the Drawings

[0020]

Fig. 1 is a diagram to explain a method of determining a change of image data between fields in a conventional example;

Fig. 2 is a diagram to explain another method of determining a change of image data between fields in another conventional example;

Fig. 3 is a block diagram illustrating the structure of a scanning system converting apparatus according to a first embodiment of the present invention;

Fig. 4A is a timing chart illustrating an effective signal which is sent from a timing signal generating section to a transfer control section, when an original image data is of a progressive scanning system;

Fig. 4B is a diagram illustrating fields of the image data of the progressive scanning system which is outputted from a transfer control section, when the original image data is of the progressive scanning system;

Fig. 5 is a diagram to explain the timing when an MPEG2 coded image data is derived from the image data of a movie film.

Fig. 6A is a timing chart illustrating the effective signal which is sent from the timing signal generating section to the transfer control section, when the original image data is of an interlace scanning system;

Fig. 6B is a diagram illustrating fields of the image data of an interlace scanning system which is outputted from a transfer control section when the original image data is of an interlace scanning system;

Fig. 7 is a diagram to explain the timing when the MPEG2 coded image data is derived from the video signal of the NTSC system;

Fig. 8 is a diagram when a decoded data and a correlation signal are transferred in a time division multiplexing manner in the scanning system converting apparatus according to a second embodiment of the present invention;

Fig. 9 is a block diagram illustrating the structure of the scanning system converting apparatus according to the second embodiment of the present inven-

tion; and

Fig. 10 is a diagram illustrating the relation of frame period and vertical axis in the image data of the interlace scanning system.

[0021] Description of the Preferred Embodiments Next, the scanning system converting apparatus of the present invention will be described with reference to the attached drawings.

[0022] Fig. 3 is a block diagram which shows the structure of the scanning system converting apparatus according to the first embodiment of this embodiment. As illustrated, the image output system is composed of an MPEG2 decoder 1, an NTSC encoder 2, a scanning system converting circuit 3, a transfer control section 4 and a graphic system 5. The scanning system converting circuit 3 is composed of a field memory 3a, an average value interpolating section 3b, a line memory 3c, a motion detecting section 3d, a field correlation determining section 3e, a timing signal generating section 3f, a switch 3g, FIFO memories 3h and 3i and a switch 3j.

[0023] The MPEG2 decoder 1 decodes an MPEG2 coded image data which has been coded in accordance with the MPEG2 and which is supplied through a communication line. Then, the MPEG2 decoder 1 outputs the decoded image data in the field frequency of the NTSC video signal of the (2:1) interlace scanning system. Also, the MPEG2 decoder 1 outputs a sync signal of the NTSC video signal.

[0024] The MPEG2 coded image data which is supplied to the MPEG2 decoder 1 is obtained by coding an image data of the interlace scanning system or an image data of the progressive scanning system. Therefore, in order to distinguish the scanning system of the image data, a signal, Progressive_sequence, is provided in a sequence extension of a sequence header in the MPEG2 coded image data. This signal is "1" when the image data of the progressive scanning system is coded into the MPEG2 coded image data, and is "0" when the image data of the interlace scanning system is coded.

[0025] Also, the image data of the progressive scanning system includes the image data of a movie film. The frame rate of the image data is 24 Hz and is different from 30 Hz of NTSC. For the purpose of the conversion of the frame rate, in the MPEG2 coded image data, a signal, repeat_first_field, is provided in the picture coding extension of the image header. When this signal is "1", the frame is repeatedly outputted so that the frame rate can be converted.

[0026] The MPEG2 decoder 1 can recognize a field having correlation in accordance with these two kinds of signals, and generates and supplies a 2-bit field correlation signal to the field correlation determining section 3e. The field correlation signal has the following meaning to each value. That is,

[0027] "00": indicates that the data is obtained by decoding the MPEG2 coded image data which has been obtained by coding an image data of the interlace scanning system and the field correlation is invalid;

[0028] "01": indicates that the field is the first field of one frame of the image data obtained by decoding the MPEG2 coded image data which has been obtained by coding an image data of progressive scanning system and that the field correlation is effective;

[0029] "10": indicates that the field is the next field of one frame of the image data obtained by decoding the MPEG2 coded image data which has been obtained by coding an image data of progressive scanning system and that the field correlation is effective; and

[0030] "11": indicates that the field is repeated based on a signal repeat_first_field and that the field correlation is effective.

[0031] The NTSC encoder 2 generates an NTSC video signal based on the decoded image data and the sync signal which are outputted from the MPEG2 decoder 1. The generated NTSC video signal is supplied to an NTSC TV monitor (not shown) so that a corresponding image is displayed on the NTSC TV monitor.

[0032] The scanning system converting circuit 3 converts the decoded image data which is outputted in the interlace scanning system from the MPEG2 decoder 1, into the progressive scanning system and supplies it to the transfer control section 4. Hereinafter, the structure of the scanning system converting circuit 3 will be described in detail.

[0033] The field memory 3a delays the decoded image data which is outputted from the MPEG2 decoder 1 and whose original image data is of the interlace scanning system, for one field timing and outputs to the motion detecting section 3d and the switch 3g.

[0034] The line memory 3c delays the decoded image data which is outputted from MPEG2 decoder 1, for one line timing of the NTSC interlace scanning system and outputs to the average value interpolating section 3b. It should be noted that in the effective image data in this embodiment, 1 line is composed of 720 pixels, 1 field is composed of 240 lines and 1 frame is composed of 2 fields, i.e., 480 lines.

[0035] The average value interpolating section 3b calculates an average value of a twice previous field of the image data which is outputted from the MPEG2 decoder 1 and a current field of the image data which is outputted from the line memory 3c for every pixel, and outputs the average value to the motion detecting section 3d and the switch 3g.

[0036] The motion detecting section 3d operates in accordance with an instruction from the field correlation determining section 3e. When the field correlation determining section 3e determines that the field correlation is effective, i.e., that the original image data is of the progressive scanning system, the motion detecting section 3d issues an instruction to the switch 3g such that the switch 3g selects the image data outputted from the field memory 3a. When the field correlation determining section 3e determines that the field correlation is invalid, i.e., that the original image data is of the interlace scanning

system, the motion detecting section 3d determines whether a difference between the image data which is outputted from the field memory 3a and the image data which is outputted from the average value interpolating section 3b is equal to or larger than a predetermined value. The motion detecting section 3d issues an instruction to the switch 3g such that the switch 3g selects the image data outputted from the average value interpolating section 3b, when the difference is equal to or larger than the predetermined value, and such that the switch 3g selects the image data outputted from the field memory 3a when the difference is smaller than the predetermined value.

[0037] The field correlation determining section 3e determines the field correlation signal outputted from the MPEG2 decoder 1. The field correlation determining section 3e issues an instruction to the motion detecting section 3d such that the switch 3g always outputs the image data which is outputted from the field memory 3a, when the field correlation is effective (when the field correlation signal is "01", "10" or "11"). Also, the field correlation determining section 3e issues an instruction to the timing signal generating section 3f such that the transfer control section 4 transfers, to the graphic system 5, only an effective portion of the image data which has been converted into the progressive scanning system, e.g., only the effective portion of the first one of fields of the frame of the image data. When the field correlation is invalid (when the field correlation signal is "00"), the field correlation determining section 3e does not issue any instruction to the motion detecting section 3d. Also, the field correlation determining section 3e issues an instruction to the timing signal generating section 3f such that the timing signal generating section 3f outputs an instruction to the transfer control section 4 so that the transfer control section 4 transfers all of the image data which has been converted into the progressive scanning system, to the graphic system. That is, the instruction is effective for the effective portion of each field of the frame of the image data.

[0038] The timing signal generating section 3f sends a timing signal to the switch 3j in accordance with the determining result by the field correlation determining section 3e and the sync signal which is outputted from the MPEG2 decoder 1 such that the switch 3j is always switched for every line.

[0039] The switch 3j alternately selects and outputs one of the image data which is outputted from the FIFO memory 3h and the image data which is outputted from the FIFO memory 3i based on this timing signal. Also, the timing signal generating section 3f sends to the transfer control section 4a a timing signal (hereinafter, to be referred to as an effective signal) indicating that the image data which is outputted from the switch 3j is effective, when the timing signal is in the high level.

[0040] The switch 3g selects and outputs one of the image data which is outputted from the field memory 3a and the image data which is outputted from the average value interpolating section 3b for every line or every pixel in accordance with the instruction from the motion detecting section 3d.

[0041] Each of the FIFO memories 3h and 3i is composed of the First-In First-Out memory which has a memory capacity of at least one line. One of the output signal of the field memory 3a and the output signal of the average value interpolating section 3b which is selectively outputted by the switching of the switch 3g is written in the FIFO memory 3h. The decoded image data which is outputted from the MPEG2 decoder 1 is written in the FIFO memory 3i.

[0042] The transfer control section 4 has a buffer memory which stores the image data outputted from the switch 3j temporarily. Also, the transfer control section 4 supplies the effective portion of the image data which has been stored in the buffer memory to the graphic system 5 at the frame rate of 60 frames per one second, based on the signal which indicates the effective portion which is supplied from the timing signal generating section 3f.

[0043] The graphic system 5 has a frame memory for storing the effective portion of the image data which has been transferred from the transfer control section 4. Also, the graphic system 5 displays an image on the monitor in the progressive scanning system. In this case, the graphic system displays the image data which is transferred from the transfer control section 4. However, when no image data is transferred from the transfer control section 4, the graphic system 5 displays the previous field or frame of the image data.

[0044] Next, an operation of the scanning system converting apparatus in the first embodiment of the present will be described.

[0045] In the scanning system converting apparatus of this embodiment, an operation in the case where the decoded image data is converted by the scanning system converting circuit 3 will be described. The operation of scanning system converting circuit 3 is different depending upon whether the MPEG2 coded image data is obtained by coding the image data of the progressive scanning system or by coding from the image data of the interlace scanning system. Hereinafter, an operation in each case will be described.

I. In case of the coded image data of the progressive scanning system

[0046] The MPEG2 decoder 1 receives the MPEG2 coded image data having Progressive_Sequence of "1". Therefore, the MPEG2 decoder 1 decodes the received MPEG2 coded image data to sequentially output as the image data of the interlace scanning system. At the same time, the MPEG2 decoder 1 supplies a sync signal to the timing signal generating section 3f, and supplies, to the field correlation determining section 3e, the field correlation signal which takes either of "01", "10" or "11" value in accordance with the field.

[0047] An instruction is sent from the field correlation determining section 3e to the motion detecting section

3d in response to such a value of the field correlation signal with such that the switch 3g selects the image data outputted from the field memory 3a. By this, the operation of the motion detecting section 3d is stopped and the switch 3g is switched to always output the image data which has been outputted from the field memory 3a.

[0048] Paying attention to the image data which has been outputted from the MPEG2 decoder 1, the image data which is outputted from the field memory 3a is delayed for one field time from the image data which has been outputted from the MPEG2 decoder 1. That is, when the image data for the first field of one frame is outputted from the field memory 3a and is written in the FIFO memory 3h, the image data for the following field is outputted from the MPEG2 decoder 1 and is written in the FIFO memory 3i.

[0049] On the other hand, the timing signal to switch the switch 3j is supplied from the timing signal generating section 3f based on the sync signal which has been supplied from the MPEG2 decoder 1. In response to this timing signal, the switch 3j is switched in response to the timing signal such that the image data outputted from the FIFO memory 3h and the image data outputted from the FIFO memory 3i are alternately outputted for every line. By this, the image data which is outputted from the switch 3j is the image data of the progressive scanning system having no skip of any line. The image data of this progressive scanning system is supplied to the transfer control section 4 and is temporarily stored in a buffer memory of the transfer control section 4.

[0050] Also, in the field correlation determining section 3e, when it is determined that the field correlation signal value is "10", an instruction is sent to the timing signal generating section 3f so as to send an effective indication signal with the high level to the transfer control section 4. As shown in Figs. 4A and 4B, based on this instruction, the effective indication signal with the high level is sent from the timing signal generating section 3f to the transfer control section 4. The transfer control section 4 transfers the effective portion of the image data which is stored newly in the buffer memory to the graphic system 5. Thus, the image data which has been transferred from the transfer control section 4 is displayed on the monitor of the graphic system 5.

[0051] On the other hand, in the field correlation determining section 3e, when it is determined that the field correlation signal value is "01" or "11", an instruction is not sent to the timing signal generating section 3f. Therefore, as shown in Figs. 4A and 4B, the effective indication signal which is sent from the timing signal generating section 3f to the transfer control section 4 becomes the low level, so that the transfer control section 4 does not transfer image data to the graphic system 5. As a result, in the graphic system 5, the image data which has been transferred last is displayed, i.e., the same image is repetitively displayed.

[0052] The timings from the decoding of the MPEG2 coded image data to the display which are described above are shown in Fig. 5, taking as an example the case that the image data before coding is the movie film which has the frame rate of 24 Hz. In this example, image data of the progressive scanning system is obtained from one field of the movie film with the frame rate of 24 Hz through the scanning system conversion. The image data is supplied to the graphic system 5 with the frame rate 75 Hz. Therefore, the same image data is repetitively displayed to eliminate the frame rate difference.

II. In case of the coded image data of the interlace scanning system

[0053] The MPEG2 decoder 1 receives the MPEG2 coded image data with Progressive_Sequence of "1". At that time, the MPEG2 decoder 1 decodes the received MPEG2 coded image data to sequentially output in the interlace scanning system. Also, the MPEG2 decoder 1 supplies the sync signal to the timing signal generating section 3f, and supplies the field correlation signal of the value of "00" to the field correlation determining section 3e.

[0054] From the line memory 3c, the image data which has been outputted from the MPEG2 decoder 1 is delayed for one line time and outputted to the average value interpolating section 3b. An average of the image data which is outputted from the line memory 3c and the image data which is outputted from the MPEG2 decoder 1 is calculated by the average value interpolating section 3b, and a signal is generated which interpolates the line which is skipped in the interlace scanning system.

[0055] On the other hand, since the field correlation signal is "00" in this case, an instruction is sent from the field correlation determining section 3e to the motion detecting section 3d. At this time, the motion detecting section 3d compares the image data which is outputted from the field memory 3a and the image data which is outputted from the average value interpolating section 3b, in response to the instruction. As to the comparing result, when it is determined that a difference between both of the image data is smaller than a predetermined value, that is, when it is determined that there is no movement between images, the motion detecting section 3d outputs an instruction to the switch 3g. As a result, the switch 3g is switched in response to the instruction from the motion detecting section 3d in such a manner that the image data outputted from the field memory 3a is selected. When it is determined that the difference between both of the image data is larger than the predetermined value, that is, when it is determined that there is movement in the image, the motion detecting section 3d outputs an instruction to the switch 3g. The switch 3g is switched in response to the instruction from the motion detecting section 3d in such a manner that the average of the image data outputted from the average value interpolating section 3b is selected. Thus, the selected image data is written in the FIFO memory 3h.

[0056] In this case, the writing of the image data which

is outputted from the MPEG2 decoder 1 in the FIFO memory 3i, the generation of the timing signal by the timing signal generating section 3f, the switching by the switch 3j, the writing of the image data which is outputted from the switch 3j into the buffer memory of the transfer control section 4 are the same as those in the case that the image data before coding is the image data of the progressive scanning system.

[0057] Also, when it is determined in the field correlation determining section 3e that the field correlation signal value is "00", an instruction is sent to the timing signal generating section 3f such that the effective indication signal with the high level is sent to the transfer control section 4. As shown in Figs. 6A and 6B, based on this instruction, the effective indication signal with the high level is sent from the timing signal generating section 3f to the transfer control section 4. The transfer control section 4 transfers to the graphic system 5, the effective portion of the image data which is stored newly in the buffer memory therein. Then, the image data which is transferred from the transfer control section 4 is displayed on the monitor of the graphic system 5.

[0058] The timings from the decoding of the MPEG2 coded image data to the display on the graphic system which are described above are shown in Fig. 7, taking as an example the case that the image data before coding is the NTSC video signal which has the frame rate of 30 Hz. In this example, each field of each frame of the image data of the progressive scanning system after the scanning system conversion is transferred to the graphic system 5. However, for the difference between the frame rates, the same image are repetitively displayed sometimes to cancel the difference.

[0059] As described above, in the scanning system converting apparatus of this embodiment, when the MPEG2 coded image data is obtained by coding the image data of the progressive scanning system, any interpolation signal is never used for the purpose of the conversion into the progressive scanning system. Therefore, the image data which is outputted from the switch 3j and which is converted into the progressive scanning system is substantively the same as the image data before coding, so that the image quality is not degraded. Moreover, the image data of the progressive scanning system which is outputted from the switch 3j is the same as the image data before coding in the frame rate, and a data amount of the image data which is transferred from the transfer control section 4 is a few.

[0060] Also, because the image data which is outputted from the MPEG2 decoder 1 is of the NTSC interlace scanning system, the image data is possible to be displayed on the NTSC TV monitor and on the monitor of the graphic system through the scanning system converting circuit 3 and the transfer control section 4.

[0061] Also, when the image data before coding is of the interlace scanning system, any problem never occurs in the conversion into the progressive scanning system, because the interpolation signal can be used.

[0062] In above-mentioned embodiment, the MPEG2 decoder 1 outputs the image data of the NTSC 2:1 interlace scanning system. However, it is possible to output the image data in another interlace scanning system, e.g., n:1 (n is an integer equal to or more than 3) interlace scanning system. In this case, it is sufficient that a plurality of field memories which have the delayed field times different from each other are provided and the FIFO memories which correspond to the plurality of field memories are provided. Also, the average value interpolating section 3b is sufficient to calculate an average weighted in accordance with the vertical distance determined in order of the fields.

[0063] In the above-mentioned embodiment, the decoded data and the field correlation signal are outputted onto the different signal lines from the MPEG2 decoder 1. However, as shown in the schematic diagram of Fig. 10 and the block diagram of Fig. 9, they may be outputted on the identical signal line in a time division multiplexing manner.

[0064] In above-mentioned embodiment, the image data which is coded in accordance with MPEG2 is described as the example. However, the present invention is not limited to this. The present invention is possible to be applied to all cases in which when the image data of the interlace scanning system or of the progressive scanning system has been coded by a coding system other than MPEG2 and is decoded and outputted in the interlace scanning system, the image data is converted into the progressive scanning system.

[0065] As described above, according to the present invention, when the image data before coding is of the image of the progressive scanning system, the image data after the scan conversion is substantively the same as the image data before coding so that the image quality is not degraded.

Claims

1. A scanning system converting system for a display unit of a progressive scanning system comprising:

a) decoding means (1) for decoding coded first image data into decoded first image data in an interlace scanning system and for outputting control data, wherein said coded first image data is obtained by coding image data of an interlace or a progressive scanning system, and said control data indicates whether the scanning system of said coded first image data is the progressive scanning system or the interlace scanning system and whether fields of said first image data are correlated;

b) control means (3e, 3f) for generating an effective indication signal and first and second control signals based on said control data supplied from said decoder; and

c) field memory means (3a) for storing a current field of said decoded first image data outputted from said decoding means (1) and for outputting with a delay of one field time a previous field of said decoded image data for every line as first line image data;

d) first line memory means (3c) for storing a current line of a current field of said decoded first image data outputted from said decoding means (1) for every line and for outputting the stored previous line of said current field for every line as second line image data;

e) interpolating means (3b) for generating interpolated image data for every line from said current line of said current field and said second line image data outputted from said first line memory means (3c) to output third line image data;

f) first switching means (3g) for selecting one of said first line image data and said third line image data in response to a first switching signal to output the selected image data as fourth line image data;

g) detecting means (3d) for detecting a difference between said first line image data and said third line image data to output said first switching signal to said first switching means (3g) in response to said first control signal and based on the detecting result, wherein, when said first image data is of a progressive scanning system, said first switching signal causes said first switching means (3g) in response to said first control signal to select said first line image data, and wherein, when said first image data is of an interlace scanning system, said first switching signal causes said first switching means (3g) based on the detecting result in response to said first control signal to select said first line image data when said difference is smaller than a predetermined value, and otherwise to select said third line image data;

h) second line memory means (3h) for storing said fourth line image data and for outputting the stored previous line of said fourth line image data as fifth line image data;

i) third line memory means (3i) for storing said current line of said current field outputted from said decoding means (1) for every line and for outputting the stored previous line of said current field as sixth line image data;and

j) second switching means (3j) for alternatingly selecting one of said fifth line image data and said sixth line image data in response to said second control signal as a second switching signal to output the selected image data as said output image data;

k) transfer means (4), comprising a buffer for intermediately storing said output image data, for transferring said output image data from said buffer to said display unit in response to an active state of said effective indication signal; and

l) wherein said control means (3e, 3f) outputs said effective indication signal such that said effective indication signal is active when said first image data is of the interlace scanning system, and such that said effective indication signal is active only for the first one of the fields of a frame of said output image data being received by said buffer from said second switching means when said first image data is of the progressive scanning system.

2. A scanning system converting system according to claim 1, wherein said coded image data is obtained by coding said first image data based on a MPEG2, and said decoding means (1) decodes said coded image data based on the MPEG2.

3. A method of converting a scanning system (3) of an image data signal into a progressive scanning system of a display unit, comprising the steps of:

a) decoding coded first image data into decoded first image data in an interlace scanning system and outputting control data, wherein said coded first image data is obtained by coding image data of an interlace or a progressive scanning system, and said control data indicates whether the scanning system of said coded first image data is the progressive scanning system or the interlace scanning system and whether fields of said first image data are correlated;

b) generating an effective indication signal and first and second control signals based on said control data;

c) storing a current field of said decoded first image data and outputting with a delay of one field time a previous field of said decoded image data for every line as first line image data;

d) storing a current line of a current field of said decoded first image data outputted for every line and outputting the stored previous line of said current field for every line as second line image data;

e) generating interpolated image data for every line from said current line of said current field and said second line image data (3c) to output third line image data;

f) selecting (3g) one of said first line image data and said third line image data in response to a first switching signal to output the selected image data as fourth line image data;

g) detecting (3d) a difference between said first line image data and said third line image data to output said first switching signal in response to said first control signal and based on the de-

tecting result, wherein, when said first image data is of a progressive scanning system, said first switching signal causes in response to said first control signal selecting said first line image data, and wherein, when said first image data is of an interlace scanning system, said first switching signal causes based on the detecting result in response to said first control signal selecting said first line image data when said difference is smaller than a predetermined value, and otherwise selecting said third line image data;

h) storing said fourth line image data and outputting the stored previous line of said fourth line image data as fifth line image data;

i) storing said current line of said current field outputted from said decoding for every line and outputting the stored previous line of said current field as sixth line image data; and

j) alternatingly selecting one of said fifth line image data and said sixth line image data in response to said second control signal as a second switching signal to output the selected image data as said output image data;

k) intermediately storing said output image data, and transferring said intermediately stored output image data to said display unit in response to an active state of said effective indication signal; and

l) wherein said generating of said effective indication signal is such that said effective indication signal is active when said first image data is of the interlace scanning system, and such that said effective indication signal is active only for the first one of the fields of a frame of said output image data being received for said intermediately storing when said first image data is of the progressive scanning system.

4. A method according to claim 3, wherein said original image data is obtained by coding an image data based on a MPEG2, and said decoding step includes decoding said coded image data based on the MPEG2.

5. A method according to claim 3, further comprising the step of selectively inhibiting said output of said sixth line image data when said original image data is of the progressive scanning system.

6. A method according to claim 5, wherein said selectively inhibiting step includes selectively inhibiting said output of said sixth line image data such that said sixth line image data for one of fields of the frame is outputted and such that said fifth line image data for the other fields of the frame is not outputted.

Patentansprüche

1. Abtastsystem-Konvertierungsvorrichtung für eine Displayeinheit eines Vollbild-Abtastsystems (Progressive Scanning System), mit:

a) einer Decodiereinrichtung (1) zum Decodieren codierter erster Bilddaten in decodierte erste Bilddaten in einem Zeilensprung-Abtastsystem (Interlaced Scanning System) und zum Ausgeben von Steuerdaten, wobei die codierten ersten Bilddaten durch Codieren von Bilddaten eines Zeilensprung- oder eines Vollbild-Abtastsystems erhalten werden, und wobei die Steuerdaten anzeigen, ob das Abtastsystem der codierten ersten Bilddaten das Vollbild-Abtastsystem oder das zeilensprung-Abtastsystem ist, und ob Felder der ersten Bilddaten korreliert sind;

b) einer Steuereinrichtung (3e, 3f) zum Erzeugen eines effektiven Anzeigesignals und eines ersten und eines zweiten Steuersignals basierend auf den von der Decodiereinrichtung zugeführten Steuerdaten;

c) einer Feldspeichereinrichtung (3a) zum Speichern eines aktuellen Feldes der von der Decodiereinrichtung (1) ausgegebenen decodierten ersten Bilddaten und zum Ausgeben eines vorangehenden Feldes der decodierten Bilddaten für jede Zeile mit einer Verzögerung von einer Feldzeit als erste Zeilenbilddaten;

d) einer ersten Zeilenspeichereinrichtung (3c) zum Speichern einer aktuellen Zeile eines aktuellen Feldes der von der Decodiereinrichtung (1) ausgegebenen decodierten ersten Bilddaten für jede Zeile und zum Ausgeben der gespeicherten vorangehenden Zeile des aktuellen Feldes für jede Zeile als zweite Zeilenbilddaten;

e) einer Interpolationseinrichtung (3b) zum Erzeugen interpolierter Bilddaten für jede Zeile von der aktuellen Zeile des aktuellen Feldes und den von der ersten zeilenspeichereinrichtung (3c) ausgegebenen zweiten Zeilenbilddaten, um dritte Zeilenbilddaten auszugeben;

f) einer ersten Schalteinrichtung (3g) zum Auswählen der ersten Zeilenbilddaten oder der dritten Zeilenbilddaten in Antwort auf ein erstes Schaltsignal, um die ausgewählten Bilddaten als vierte Zeilenbilddaten auszugeben;

g) einer Erfassungseinrichtung (3d) zum Erfassen einer Differenz zwischen den ersten Zeilenbilddaten und den dritten Zeilenbilddaten zum Ausgeben des ersten Schaltsignals an die erste Schalteinrichtung (3g) in Antwort auf das erste Steuersignal und basierend auf dem Erfassungsergebnis, wobei, wenn die ersten Bilddaten Daten eines Vollbild-Abtastsystems sind, das erste Schaltsignal die erste Schalteinrich-

tung (3g) in Antwort auf das erste Steuersignal veranlasst, die ersten Zeilenbilddaten auszuwählen, und wobei, wenn die ersten Bilddaten Daten eines zeilensprung-Abtastsystems sind, das erste Schaltsignal die erste Schalteinrichtung (3g) basierend auf dem Erfassungsergebnis in Antwort auf das erste Steuersignal veranlasst, die ersten Zeilenbilddaten auszuwählen, wenn die Differenz kleiner ist als ein vorgegebener Wert, und andernfalls die dritten Zeilenbilddaten auszuwählen;

h) einer zweiten Zeilenspeichereinrichtung (3h) zum Speichern der vierten Zeilenbilddaten und zum Ausgeben der gespeicherten vorangehenden Zeile der vierten Zeilenbilddaten als fünfte Zeilenbilddaten;

i) einer dritten Zeilenspeichereinrichtung (3i) zum Speichern der aktuellen Zeile des von der Decodiereinrichtung (1) ausgegebenen aktuellen Feldes für jede Zeile und zum Ausgeben der gespeicherten vorangehenden Zeile des aktuellen Feldes als sechste Zeilenbilddaten;

j) einer zweiten Schalteinrichtung (3j) zum abwechselnden Auswählen der fünften Zeilenbilddaten oder der sechsten Zeilenbilddaten in Antwort auf das zweite Steuersignal als ein zweites Schaltsignal, um die ausgewählten Bilddaten als Ausgangsbilddaten auszugeben; und

k) einer Übertragungseinrichtung (4) mit einem Puffer zum zwischenspeichern der Ausgangsbilddaten und zum Übertragen der Ausgangsbilddaten vom Puffer zur Displayeinheit in Antwort auf einen aktiven Zustand des effektiven Anzeigesignals; wobei

(l) die Steuereinrichtung (3e, 3f) das effektive Anzeigesignal derart ausgibt, dass das effektive Anzeigesignal aktiv ist, wenn die ersten Bilddaten Daten des zeilensprung-Abtastsystems sind, und derart, dass das effektive Anzeigesignal nur für das erste der Felder eines Rahmens der Ausgangsbilddaten aktiv ist, die durch den Puffer von der zweiten Schalteinrichtung empfangen werden, wenn die ersten Bilddaten Daten des Vollbild-Abtastsystems sind.

2. Abtastsystem-konvertierungsvorrichtung nach Anspruch 1, wobei die codierten Bilddaten durch Codieren der ersten Bilddaten basierend auf einem MPEG2-Standard erhalten werden und die Decodiereinrichtung (1) die codierten Bilddaten basierend auf dem MPEG2-Standard decodiert.

3. Verfahren zum Konvertieren eines Abtastsystems (3) eines Bilddatensignals in ein Vollbild-Abtastsystem einer Displayeinheit, mit den Schritten:

a) Decodieren codierter erster Bilddaten in decodierte erste Bilddaten in einem Zeilensprung-Abtastsystem und Ausgeben von Steuerdaten, wobei die codierten ersten Bilddaten durch Codieren von Bilddaten eines Zeilensprung- oder eines Vollbild-Abtastsystems erhalten werden, und wobei die Steuerdaten anzeigen, ob das Abtastsystem der codierten ersten Bilddaten das Vollbild-Abtastsystem oder das Zeilensprung-Abtastsystem ist, und ob Felder der ersten Bilddaten korreliert sind;

b) Erzeugen eines effektiven Anzeigesignals und eines ersten und eines zweiten steuersignals basierend auf den Steuerdaten;

c) Speichern eines aktuellen Feldes der decodierten ersten Bilddaten und zum Ausgeben eines vorangehenden Feldes der decodierten Bilddaten für jede Zeile mit einer Verzögerung von einer Feldzeit als erste Zeilenbilddaten;

d) Speichern einer aktuellen Zeile eines aktuellen Feldes der für jede Zeile ausgegebenen decodierten ersten Bilddaten und Ausgeben der gespeicherten vorangehenden Zeile des aktuellen Feldes für jede Zeile als zweite Zeilenbilddaten;

e) Erzeugen interpolierter Bilddaten für jede Zeile von der aktuellen Zeile des aktuellen Feldes und den zweiten Zeilenbilddaten (3c), um dritte Zeilenbilddaten auszugeben;

f) Auswählen (3g) der ersten Zeilenbilddaten oder der dritten Zeilenbilddaten in Antwort auf ein erstes Schaltsignal, um die ausgewählten Bilddaten als vierte Zeilenbilddaten auszugeben;

g) Erfassen (3d) einer Differenz zwischen den ersten Zeilenbilddaten und den dritten Zeilenbilddaten zum Ausgeben des ersten Schaltsignals in Antwort auf das erste Steuersignal und basierend auf dem Erfassungsergebnis, wobei, wenn die ersten Bilddaten Daten eines vollbild-Abtastsystems sind, das erste Schaltsignal in Antwort auf das erste Steuersignal veranlasst, die ersten Zeilenbilddaten auszuwählen, und wobei, wenn die ersten Bilddaten Daten eines Zeilensprung-Abtastsystems sind, das erste Schaltsignal basierend auf dem Erfassungsergebnis in Antwort auf das erste Steuersignal veranlasst, die ersten Zeilenbilddaten auszuwählen, wenn die Differenz kleiner ist als ein vorgegebener Wert, und andernfalls die dritten Zeilenbilddaten auszuwählen;

h) Speichern der vierten Zeilenbilddaten und Ausgeben der gespeicherten vorangehenden Zeile der vierten Zeilenbilddaten als fünfte Zeilenbilddaten;

i) Speichern der aktuellen Zeile des im Decodierschritt ausgegebenen aktuellen Feldes für jede Zeile und Ausgeben der gespeicherten vorangehenden Zeile des aktuellen Feldes als sechste Zeilenbilddaten;

j) abwechselndes Auswählen der fünften Zeilenbilddaten oder der sechsten Zeilenbilddaten in Antwort auf das zweite steuersignal als ein zweites Schaltsignal, um die ausgewählten Bilddaten als Ausgangsbilddaten auszugeben; und
k) zwischenspeichern der Ausgangsbilddaten und Übertragen der zwischengespeicherten Ausgangsbilddaten zur Displayeinheit in Antwort auf einen aktiven Zustand des effektiven Anzeigesignals; wobei
(l) das effektive Anzeigesignal derart erzeugt wird, dass das effektive Anzeigesignal aktiv ist, wenn die ersten Bilddaten Daten des Zeilensprung-Abtastsystems sind, und derart, dass das effektive Anzeigesignal nur für das erste der Felder eines Rahmens der Ausgangsbilddaten aktiv ist, die zum Zwischenspeichern empfangen werden, wenn die ersten Bilddaten Daten des Vollbild-Abtastsystems sind.

4. Verfahren nach Anspruch 3, wobei die Originalbilddaten durch Codieren von Bilddaten basierend auf einem MPEG2-Standard erhalten werden, und wobei der Decodierschritt das Decodieren der codierten Bilddaten basierend auf dem MPEG2-Standard aufweist.

5. Verfahren nach Anspruch 3, ferner mit dem Schritt zum selektiven Unterdrücken der Ausgabe der sechsten Zeilenbilddaten, wenn die Originalbilddaten Daten des Vollbild-Abtastsystems sind.

6. Verfahren nach Anspruch 5, wobei der selektive Unterdrückungsschritt das selektive Unterdrücken der Ausgabe der sechsten Zeilenbilddaten derart aufweist, dass die sechsten Zeilenbilddaten für eines von Feldern des Rahmens ausgegeben werden, und derart, dass die fünften Bildzeilendaten für die anderen Felder des Rahmens nicht ausgegeben werden.

Revendications

1. Système de transformation de système de balayage pour une unité d'affichage d'un système de balayage progressif comprenant :

a) un moyen de décodage (1) pour décoder des premières données d'image codées en premières données d'image décodées dans un système de balayage entrelacé et pour sortir des données de commande, dans lequel lesdites premières données d'image codées sont obtenues en codant des données d'image d'un système de balayage progressif ou entrelacé, et lesdites données de commande indiquent si le système de balayage desdites premières données d'image codées est le système de balayage progressif ou le système de balayage entrelacé et si des champs desdites premières données d'image sont corrélés ;
b) un moyen de commande (3e, 3f) pour générer un signal d'indication efficace et des premier et second signaux de commande sur base desdites données de commande fournies en provenance dudit décodeur ; et
c) un moyen de mémoire de champ (3a) pour stocker un champ courant desdites premières données d'image décodées sorties en provenance dudit moyen de décodage (1) et pour sortir avec un retard de temps d'un champ, un champ précédent desdites données d'image décodées pour chaque ligne en tant que premières données d'image de ligne ;
d) un premier moyen de mémoire de ligne (3c) pour stocker une ligne courante d'un champ courant desdites premières données d'image décodées sorties en provenance dudit moyen de décodage (1) pour chaque ligne et pour sortir la ligne précédente stockée dudit champ courant pour chaque ligne en tant que secondes données d'image de ligne ;
e) un moyen d'interpolation (3b) pour générer des données d'image interpolées pour chaque ligne à partir de ladite ligne courante dudit champ courant et desdites secondes données d'image de ligne sorties en provenance dudit premier moyen de mémoire de ligne (3c) pour sortir des troisièmes données d'image de ligne ;
f) un premier moyen de commutation (3g) pour sélectionner l'une desdites premières données d'image de ligne et desdites troisièmes données d'image de ligne en réponse à un premier signal de commutation pour sortir les données d'image sélectionnées en tant que quatrièmes données d'image de ligne ;
g) un moyen de détection (3d) pour détecter une différence entre lesdites premières données d'image de ligne et lesdites troisièmes données d'image de ligne pour sortir ledit premier signal de commutation vers ledit premier moyen de commutation (3g) en réponse audit premier signal de commande et sur base du résultat de détection, dans lequel, lorsque lesdites premières données d'image sont d'un système de balayage progressif, ledit premier signal de commutation amène ledit premier moyen de commutation (3g) en réponse audit premier signal de commande à sélectionner lesdites premières données d'image de ligne, et dans lequel, lorsque lesdites premières données d'image sont d'un système de balayage entrelacé, ledit premier signal de commutation amène ledit premier moyen de commutation (3g) sur base du résultat de détection en réponse audit premier signal de

commande à sélectionner lesdites premières données d'image de ligne lorsque ladite différence est plus petite qu'une valeur prédéterminée, et autrement à sélectionner lesdites troisièmes données d'image de ligne ;

h) un deuxième moyen de mémoire de ligne (3h) pour stocker lesdites quatrièmes données d'image de ligne et pour sortir la ligne précédente stockée desdites quatrièmes données d'image de ligne en tant que cinquièmes données d'image de ligne ;

i) un troisième moyen de mémoire de ligne (3i) pour stocker ladite ligne courante dudit champ courant sorti en provenance dudit moyen de décodage (1) pour chaque ligne et pour sortir la ligne précédente stockée dudit champ courant en tant que sixièmes données d'image de ligne ; et

j) un deuxième moyen de commutation (3j) pour sélectionner en alternance l'une desdites cinquièmes données d'image de ligne et desdites sixièmes données d'image de ligne en réponse audit deuxième signal de commande en tant que deuxième signal de commutation pour sortir les données d'image sélectionnées en tant que dites données d'image de sortie ;

k) un moyen de transfert (4), comprenant un tampon pour stocker temporairement lesdites données d'image de sortie, pour transférer lesdites données d'image de sortie depuis ledit tampon vers ladite unité d'affichage en réponse à un état actif dudit signal d'indication efficace ; et

l) dans lequel ledit moyen de commande (3e, 3f) sort ledit signal d'indication efficace de sorte que ledit signal d'indication efficace est actif quand lesdites premières données d'image sont du système de balayage entrelacé, et de sorte que ledit signal d'indication efficace est actif seulement pour le premier des champs d'une trame desdites données d'image de sortie étant reçues par ledit tampon en provenance dudit deuxième moyen de commutation lorsque lesdites premières données d'image sont du système de balayage progressif.

2. système de transformation de système de balayage selon la revendication 1, dans lequel lesdites données d'image codées sont obtenues en codant lesdites premières données d'image sur base d'un MPEG2, et ledit moyen de décodage (1) décode lesdites données d'image codées sur base du MPEG2.

3. Procédé de transformation d'un système de balayage (3) d'un signal de données d'image en un système de balayage progressif d'une unité d'affichage, comprenant les étapes de :

a) décoder des premières données d'image codées en premières données d'image décodées dans un système de balayage entrelacé et sortie de données de commande, dans lequel lesdites premières données d'image codées sont obtenues en codant des données d'image d'un système de balayage progressif ou entrelacé, et lesdites données de commande indiquent si le système de balayage desdites premières données d'image codées est le système de balayage progressif ou le système de balayage entrelacé et si des champs desdites premières données d'image sont corrélés ;

b) générer un signal d'indication efficace et des premier et second signaux de commande basés sur lesdites données de commande ;

c) stocker un champ courant desdites premières données d'image décodées et sortir avec un retard de temps d'un champ, un champ précédent desdites données d'image décodées pour chaque ligne en tant que premières données d'image de ligne ;

d) stocker une ligne de courant d'un champ courant desdites premières données d'image décodées sorties pour chaque ligne et sortir la ligne précédente stockée dudit champ courant pour chaque ligne en tant que deuxièmes données d'image de ligne ;

e) générer des données d'image interpolées pour chaque ligne à partir de ladite ligne courante dudit champ courant et desdites deuxièmes données d'image de ligne (3e) pour sortir des troisièmes données d'image de ligne ;

f) sélectionner (3g) une desdites premières données d'image de ligne et desdites troisièmes données d'image de ligne en réponse à un premier signal de commutation pour sortir les données d'image sélectionnées en tant que quatrièmes données d'image de ligne ;

g) détecter (3d) une différence entre lesdites premières données d'image de ligne et lesdites troisièmes données d'image de ligne pour sortir ledit premier signal de commutation en réponse audit premier signal de commande et sur base du résultat de détection, dans lequel, lorsque lesdites premières données d'image sont d'un système de balayage progressif, ledit premier signal de commutation provoque, en réponse audit premier signal de commande, la sélection desdites premières données d'image de ligne, et dans lequel, lorsque lesdites premières données d'image sont d'un système de balayage entrelacé, ledit premier signal de commutation provoque, sur base du résultat de détection en réponse audit premier signal de commande, la sélection desdites premières données d'image de ligne lorsque ladite différence est plus petite qu'une valeur prédéterminée et autrement la sé-

lection desdites troisièmes données d'image de ligne ;

h) stocker lesdites quatrièmes données d'image de ligne et sortie de la ligne précédente stockée desdites quatrièmes données d'image de ligne en tant que cinquièmes données d'image de ligne ;

i) stocker ladite ligne courante dudit champ courant sorti en provenance dudit décodage pour chaque ligne et sortir la ligne précédente stockée dudit champ courant en tant que sixièmes données d'image de ligne ; et

j) sélectionner en alternance l'une desdites cinquièmes données d'image de ligne et desdites sixièmes données d'image de ligne en réponse audit deuxième signal de commande en tant que second signal de commutation pour sortir les données d'image sélectionnées en tant que dites données d'image de sortie ;

k) stocker temporairement lesdites données d'image sorties et transférer lesdites données d'image de sortie stockées temporairement vers ladite unité d'affichage en réponse à un état actif dudit signal d'indication efficace ; et

l) dans lequel ladite génération dudit signal d'indication efficace est telle que ledit signal d'indication efficace est actif quand lesdites premières données d'image sont du système de balayage entrelacé, et telle que ledit signal d'indication efficace est actif seulement pour le premier des champs d'une trame desdites données d'image de sortie reçues pour ledit stockage temporaire lorsque lesdites premières données d'image sont du système de balayage progressif.

4. Procédé selon la revendication 3, dans lequel lesdites données d'image d'origine sont obtenues en codant des données d'image sur base d'un MPEG2, et ladite étape de décodage inclut le décodage desdites données d'image codées sur base du MPEG2.

5. Procédé selon la revendication 3, comprenant en outre l'étape d'inhibition sélective de ladite sortie desdites sixièmes données d'image de ligne lorsque lesdites données d'image originales sont du système de balayage progressif.

6. Procédé selon la revendication 5, dans lequel ladite étape d'inhibition sélective inclut l'inhibition sélective de ladite sortie desdites sixièmes données d'image de ligne de sorte que lesdites sixièmes données d'image de ligne pour un des champs de la trame sont sorties et de sorte que lesdites cinquièmes données d'image de ligne pour les autres champs de la trame ne sont pas sorties.

Fig. 1 PRIOR ART

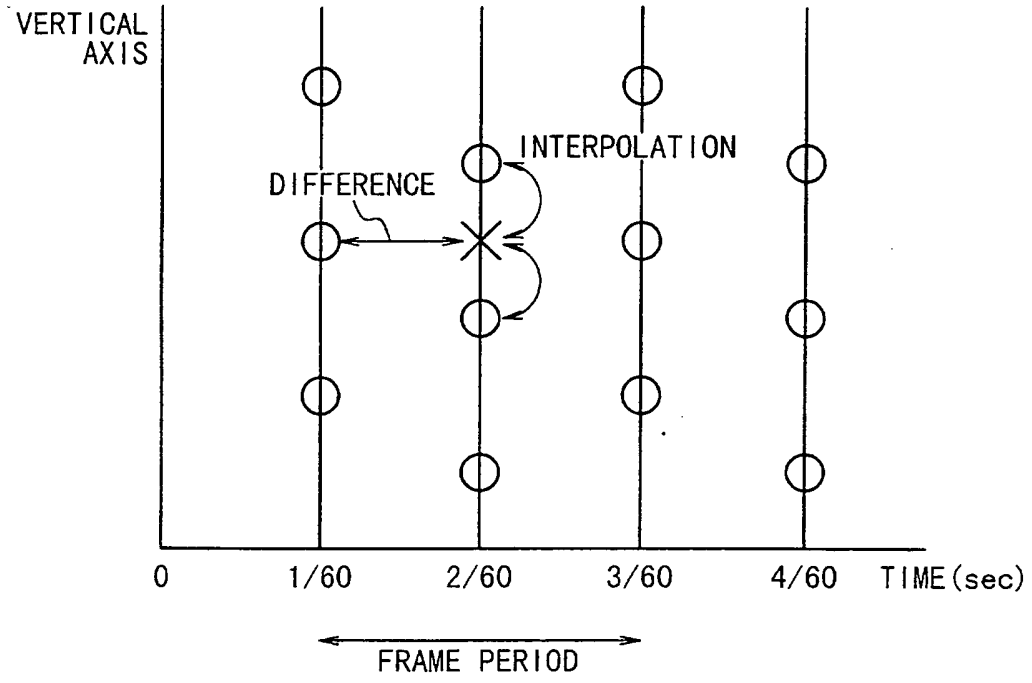


Fig. 2 PRIOR ART

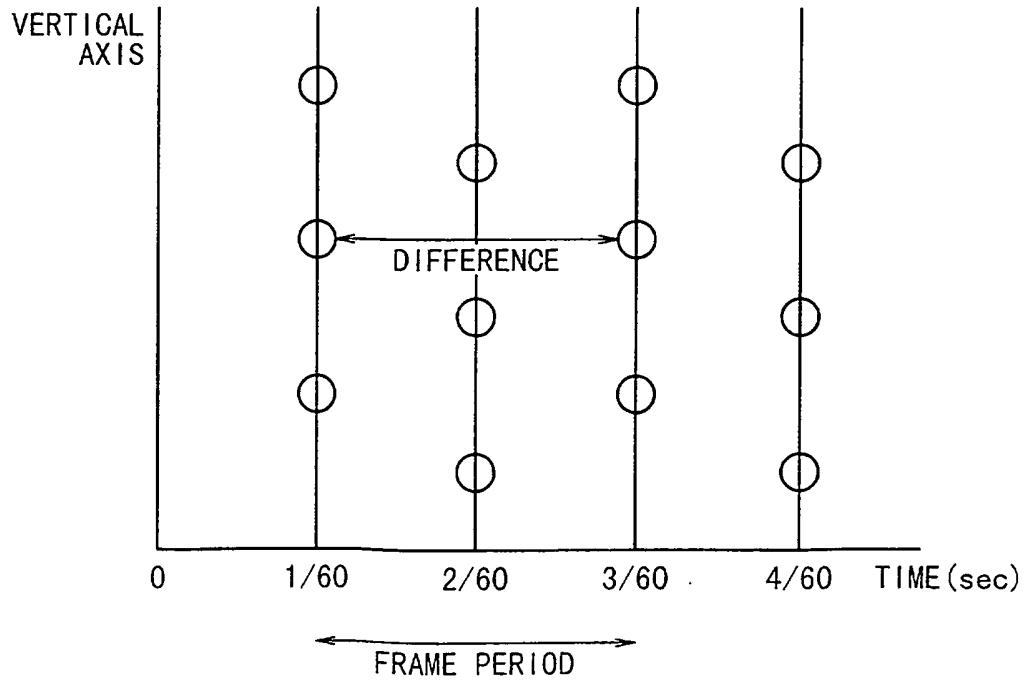


Fig. 3

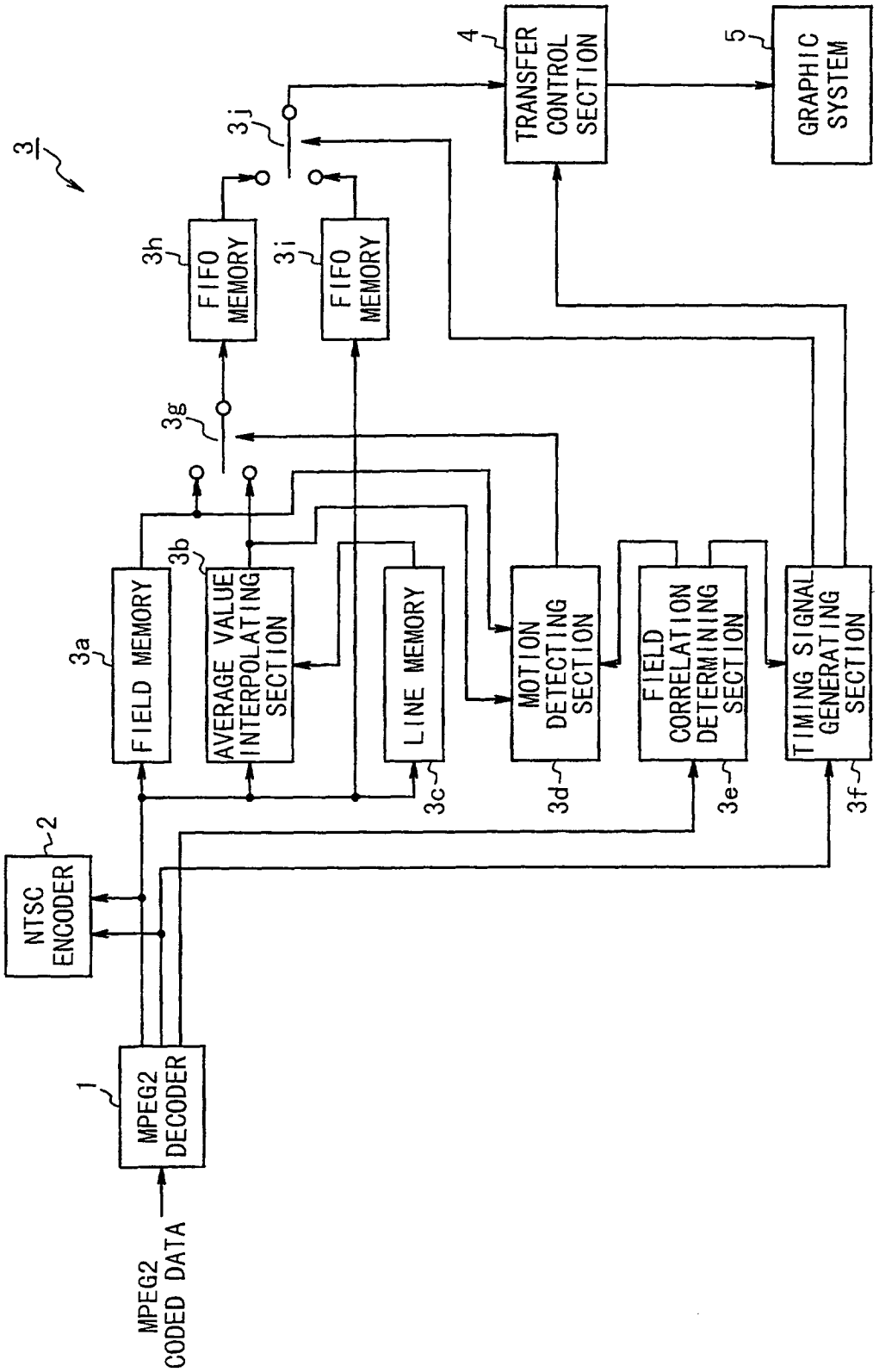

MPEG2 CODED DATA
1
MPEG2 DECODER
2
NTSC ENCODER
3
3a
FIELD MEMORY
3b
AVERAGE VALUE INTERPOLATING SECTION
3c
LINE MEMORY
3d
MOTION DETECTING SECTION
3e
FIELD CORRELATION DETERMINING SECTION
3f
TIMING SIGNAL GENERATING SECTION
3g
3h
FIFO MEMORY
3i
FIFO MEMORY
3j
4
TRANSFER CONTROL SECTION
5
GRAPHIC SYSTEM

Fig. 4A

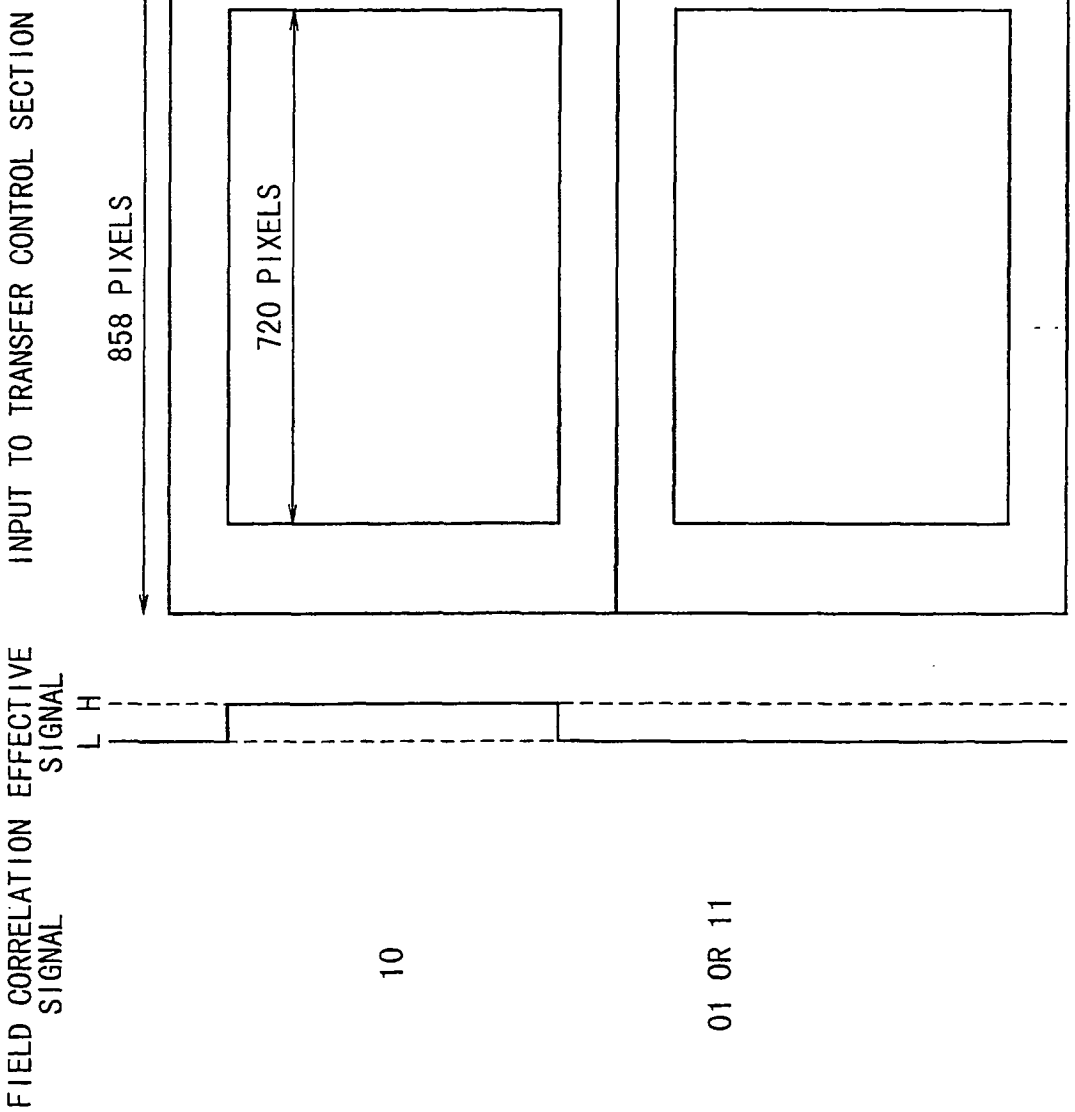

FIELD CORRELATION SIGNAL
EFFECTIVE SIGNAL
L H
10
01 OR 11

Fig. 4B

525 LINES
480 LINES
858 PIXELS
720 PIXELS
INPUT TO TRANSFER CONTROL SECTION

Fig. 5

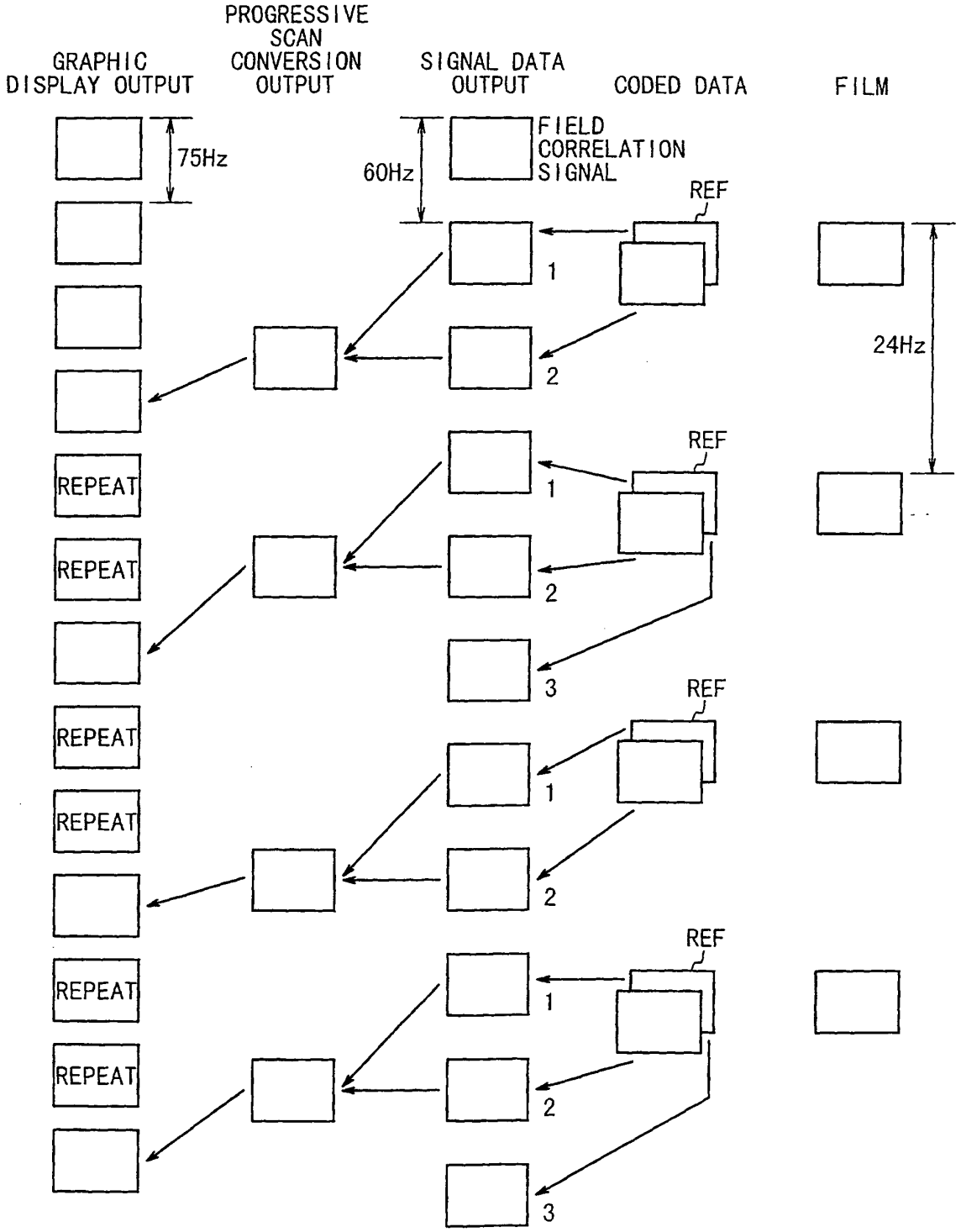

GRAPHIC DISPLAY OUTPUT
PROGRESSIVE SCAN CONVERSION OUTPUT
SIGNAL DATA OUTPUT
CODED DATA
FILM
75Hz
60Hz
FIELD CORRELATION SIGNAL
REF
1
2
3
24Hz
REPEAT

Fig. 6B

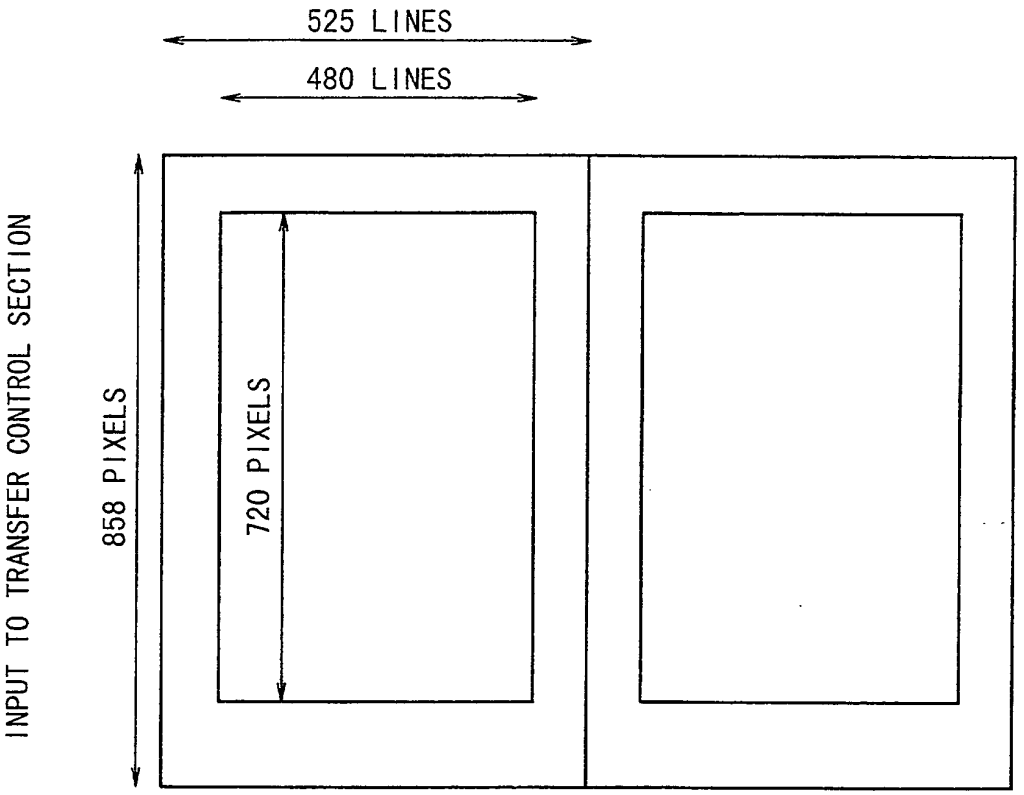

525 LINES
480 LINES
858 PIXELS
720 PIXELS
INPUT TO TRANSFER CONTROL SECTION

Fig. 6A

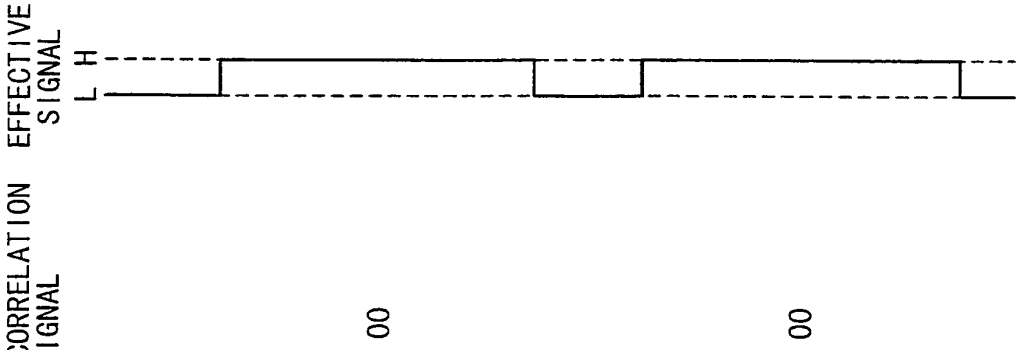

EFFECTIVE SIGNAL
L H
FIELD CORRELATION SIGNAL
00
00

Fig. 7

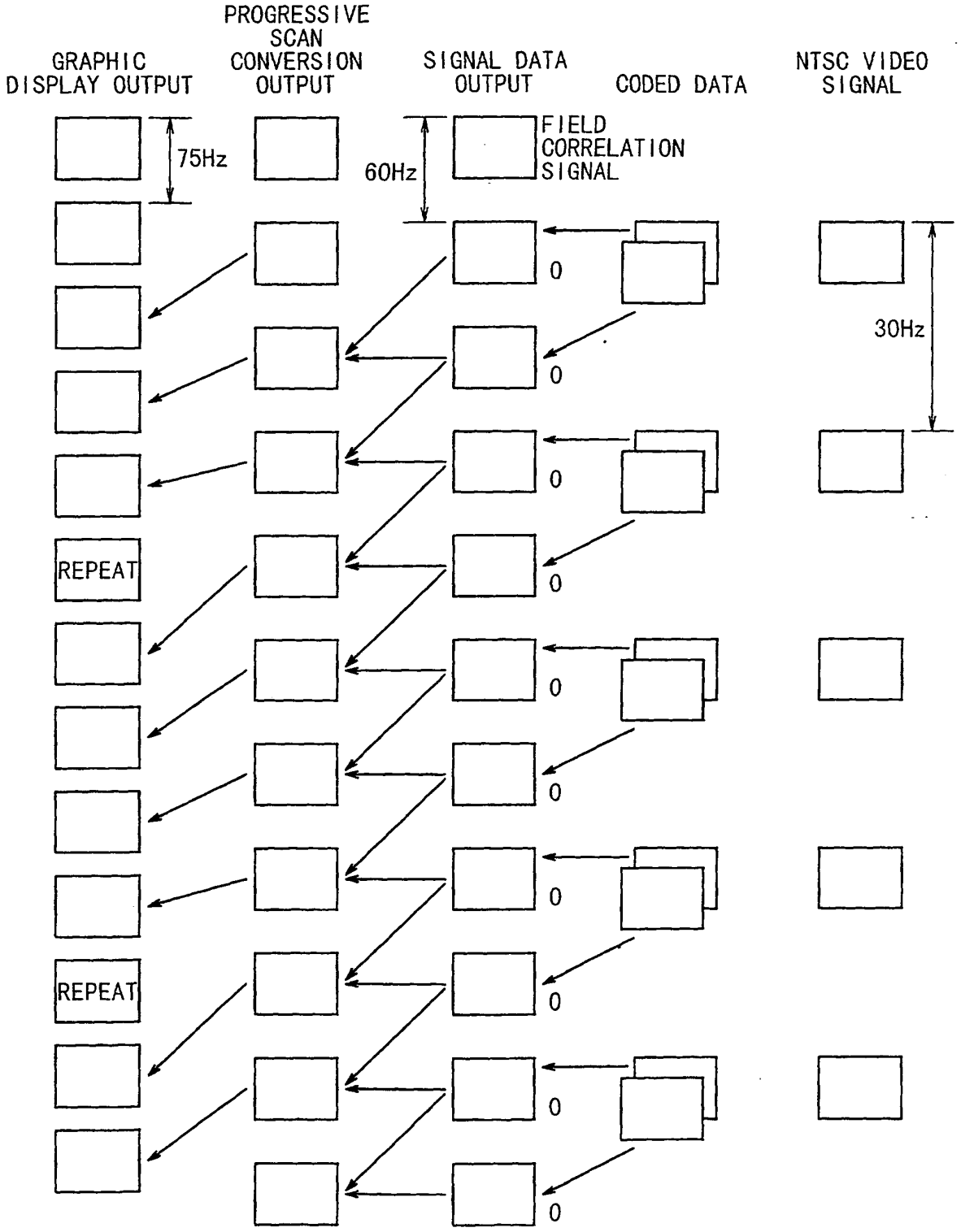

GRAPHIC DISPLAY OUTPUT
PROGRESSIVE SCAN CONVERSION OUTPUT
SIGNAL DATA OUTPUT
CODED DATA
NTSC VIDEO SIGNAL
75Hz
60Hz
FIELD CORRELATION SIGNAL
30Hz
REPEAT
REPEAT
0

Fig. 8

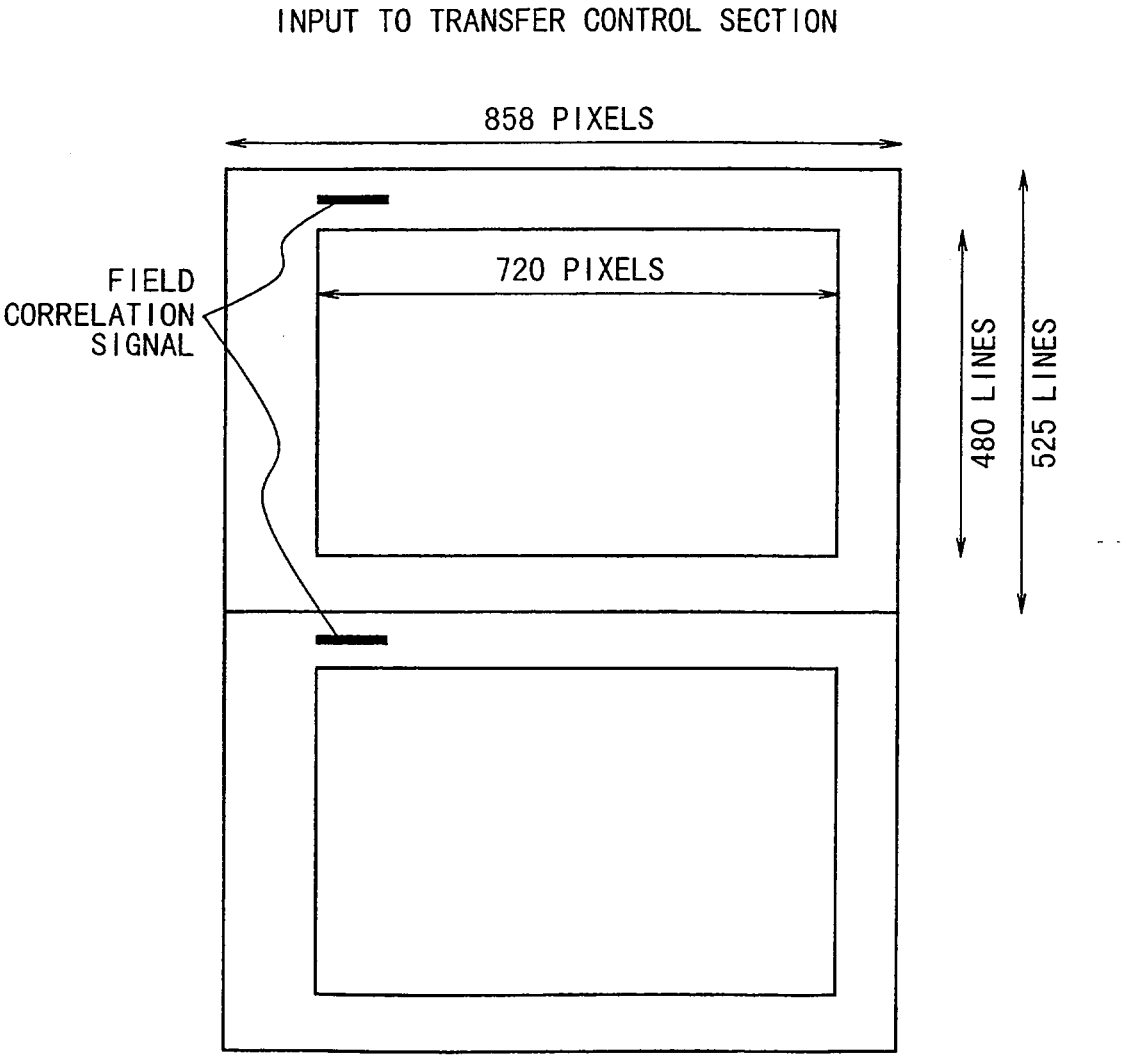

INPUT TO TRANSFER CONTROL SECTION
858 PIXELS
720 PIXELS
FIELD
CORRELATION
SIGNAL
480 LINES
525 LINES

Fig. 9

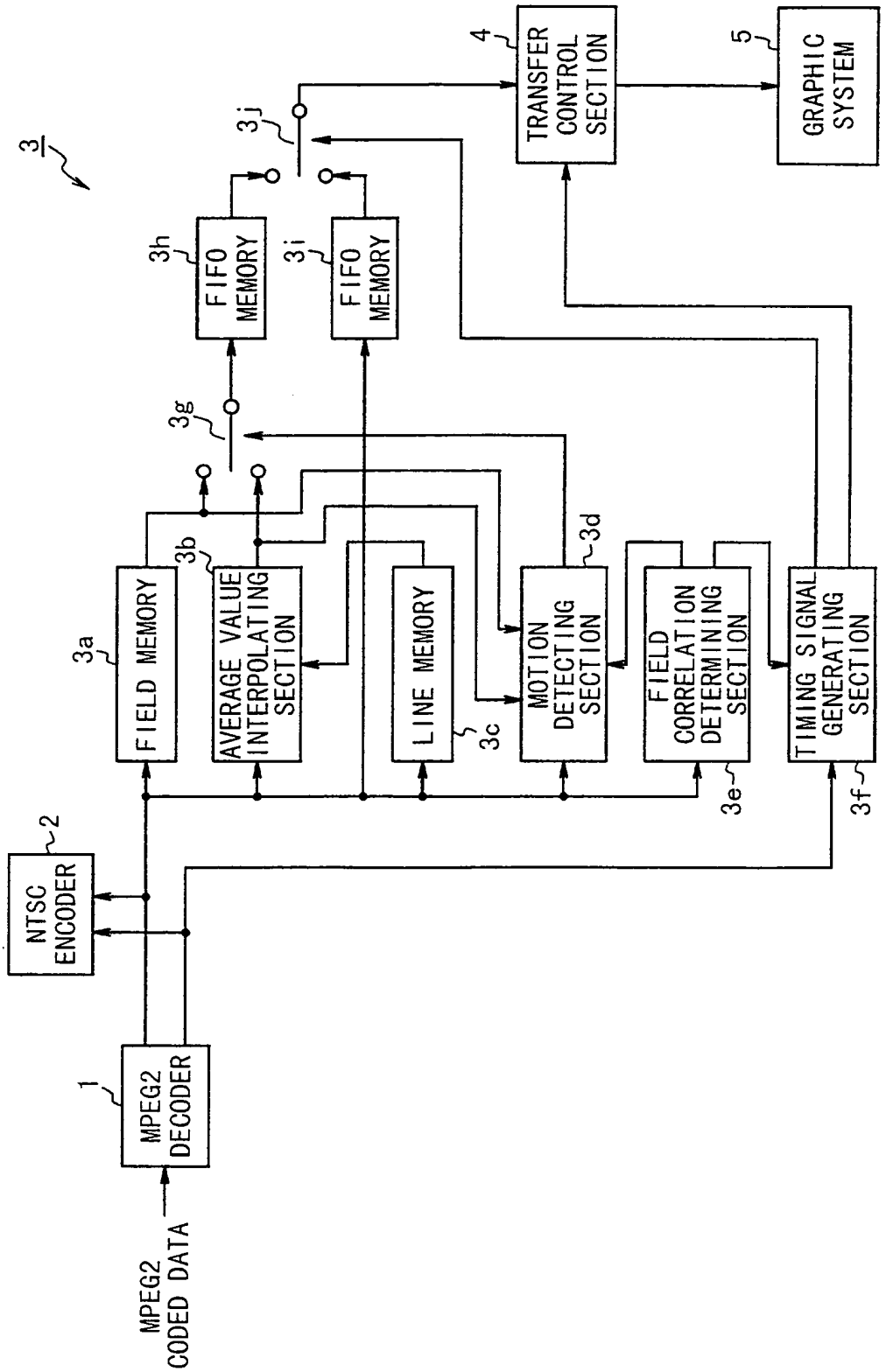
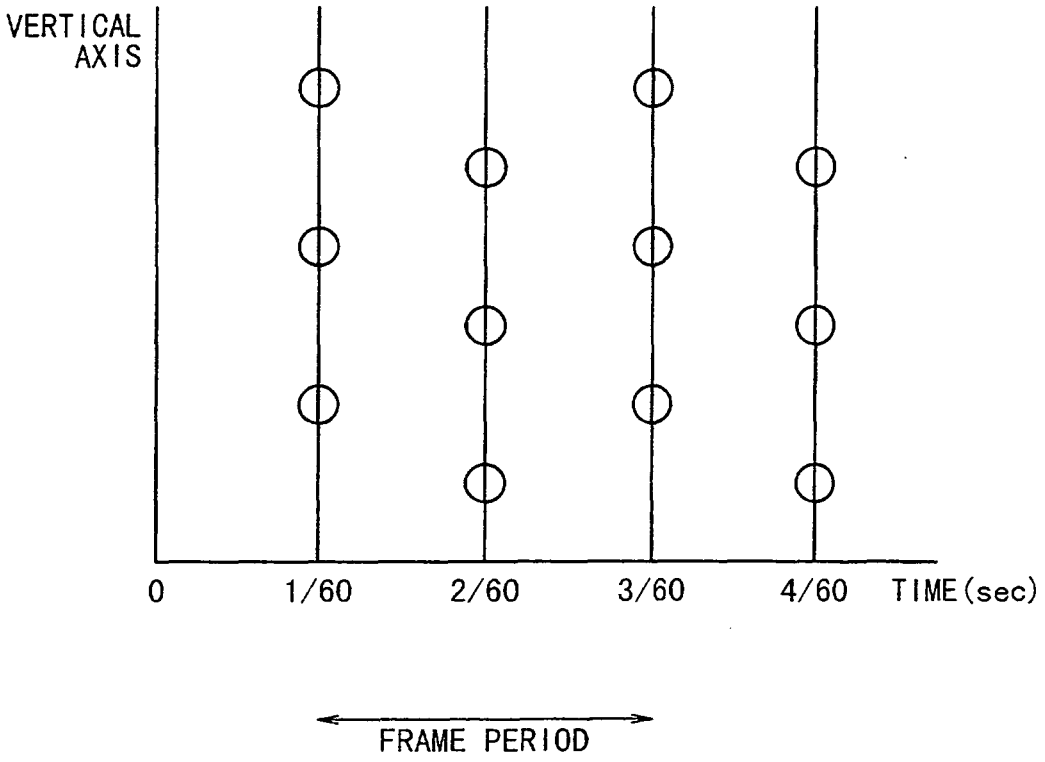

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3g
3h
FIFO MEMORY
3i
FIFO MEMORY
3j
4
TRANSFER CONTROL SECTION
5
GRAPHIC SYSTEM

Fig. 10



REFERENCES CITED IN THE DESCRIPTION

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